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IN THE UNITED STATES PATENT AND TRADMARK OFFICE

In re the application of	: TATSUMI et al.
Serial Number	: 10/774,472
Filed	: February 10, 2004
For	: ELECTROSTATIC CHUCKING DEVICE AND MANUFACTURING METHOD THEREOF
Group Art Unit	: 1711

DECLARATION UNDER 37 CFR 1.132

Honorable Commissioner for Patents
Alexandria, VA. 22313-1450

Sir:

Now comes Kinya MIYASHITA who declares and says that:

1. I am an inventor of United States Patent Application Number 10/774,472.

2. I graduated from Kansai University in 1987, and studied Electronic Engineering.

3. I have been employed by Creative Technology Corporation since 1989, and studied machining and bonding of ceramic, metal and polymer. And I am working concerning the manufacturing machine of the semiconductor, and have much experience and knowledge in the field of etching equipment especially.

4. I experimented in order to inspect about the advantage acquired by using thermoplastic polyimide film in which bonding is possible at low temperature in the process of manufacture of the electrostatic chucking device.
Experiments 1 and 2 correspond to the following.

Experiment 1: Comparison of the adhesion strength of the low temperature thermoplastic polyimide film and the normal thermoplastic polyimide film.
Low temperature thermoplastic polyimide film : Espanex (the present invention)
Normal thermoplastic polyimide film : Kapton KJ (Chen et al.: US Pat. 5,691,876)

Experiment 2: Comparison of the damage of anodized aluminum substrate of the low temperature thermoplastic polyimide film and the normal thermoplastic polyimide film.

Low temperature thermoplastic polyimide film : Espanex (the present invention)
Normal thermoplastic polyimide film : Kapton KJ (Chen et al.: US Pat. 5,691,876)

EXPERIMENT

Experiment 1

Comparison of the adhesion strength of the low temperature polyimide film (Espanex) and the normal thermoplastic polyimide film (Kapton KJ).

1. Samples

Sample No.	Construction of sample	Press conditions
1	Aluminum plate／Espanex／Copper foil	180degrees C、60min、50kgf/cm^2
2	Aluminum plate／Espanex／Copper foil	350 degrees C、60min、50kgf/cm^2
3	Aluminum plate／Kapton KJ／Copper foil	350 degrees C、60min、50kgf/cm^2
4	Aluminum plate／Kapton KJ／Copper foil	180 degrees C、60min、50kgf/cm^2

2. Measurement apparatus

UNIVERSAL TESTING MACHINE AUTOGRAPH AGS-H
(SHIMAZU CORPORATION)

3. Method

The copper foil is bonded to the aluminum plate by low temperature thermoplastic polyimide film or the normal polyimide adhesive.
And the copper foil is peeled from the aluminum plate by the method of JIS-C6471.

4. Measurement conditions

Width 1mm Direction 90 degrees , Adhesive evaluation (JIS-C6471)

5. Results

Sample No.	Construction of sample	Press conditions	Adhesive strength (kN/m)
1	Aluminum plate/Espanex /Copper foil	180degrees C, 60min 50kgf/cm^2	1.4
2	Aluminum plate/Espanex /Copper foil	350 degrees C, 60min 50kgf/cm^2	0 (impossible to adhere)
3	Aluminum plate/Kapton KJ /Copper foil	350 degrees C, 60min 50kgf/cm^2	1.2
4	Aluminum plate/Kapton KJ /Copper foil	180 degrees C, 60min 50kgf/cm^2	0 (impossible to adhere)

Experiment 2

Comparison of the damages of anodized aluminum substrate of the low temperature thermoplastic polyimide film (Espanex) and the normal thermoplastic polyimide film (Kapton KJ).

To know the level of damage, the test pieces were evaluated as follows.

Surface observation with microscope

Resistance of the anodized layer

Roughness of the anodized layer

1. Samples

Sample No.	Construction of sample	Press conditions
1	Aluminum plate/Espanex/Copper foil	180degrees C, 60min 50kgf/cm^2
2	Aluminum plate/Kapton KJ/Copper foil	350 degrees C, 60min 50kgf/cm^2

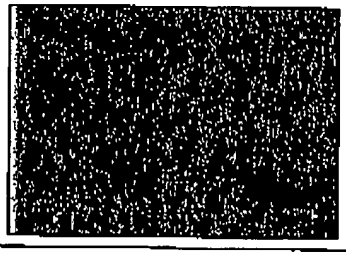
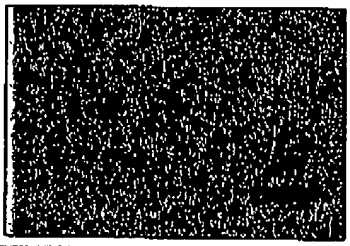
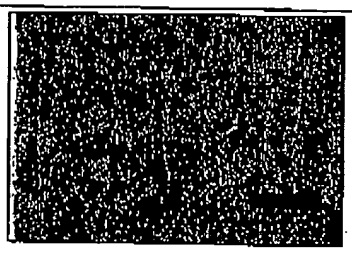
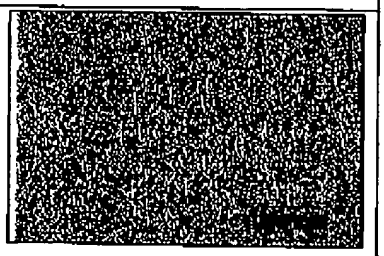
2. Measurement apparatus

Surface observation : CCD Microscope (KEYENCE)
Resistance : Insulation Tester 2406D (YOKOGAWA Electric Corporation)
Roughness : Roughness Tester SJ-301 (Mitsutoyo)

3. Method

Using the sample 1 and the sample 2 that were made at the experiment 1. Measuring roughness and resistance of the surface, and observing damage of anodized surface after peeling the copper foil and thermoplastic polyimide film (Espanex or Kapton KJ)

4. Results

Sample No.	Comparing items	Before Bonding	After Bonding
1	surface		
	Resistance	1000MΩ	800MΩ
	Roughness	4.5	4.7
2	surface		
	Resistance	1000MΩ	3MΩ
	Roughness	4.4	6.2

CONCLUSIONS

I can conclude as follows on the basis of the foregoing.

1. Adhesive strength of the low temperature thermoplastic polyimide film (Espanex) is higher than the normal thermoplastic polyimide film (Kapton KJ) at the proper adhesion conditions. And the normal thermoplastic polyimide film (Kapton KJ) can not be used at the low temperature bonding.

2. As shown in the experiment 2, it was found that the anodized surface of the substrate cracked, the insulation resistance decreased by the high temperature adhesion (Kapton KJ). And the other hand, it was found that there was no problem on the anodized surface of the substrate by the low temperature adhesion (Espanex).

3. I am convinced that the advantage of the low temperature adhesion was able to be proven by experiment 1 and 2 as stated above.

I, the undersigned petitioner, further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

This 27th day of September 2005

Kinya Miyashita

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